

The contact surface or face of the electrode is pre-conditioned or formed from a contact face plating material including the same principal metal or metals being plated onto the surface of the microelectronic workpiece. In at least one embodiment, the contact face plating material is the same material as the material being plated onto the microelectronic workpiece. As noted in the description of the present application on page 77, lines 22-24, the use of the above noted same or similar material for the electrode contact surface or face prevents galvanic or other types of chemical reactions from developing between the microelectronic workpiece and the electrode due to dissimilarity of the metals involved.

35 U.S.C. §112 rejections

The Examiner has rejected claims 1-18, under 112 second paragraph as being indefinite. The Applicants have amended the claims taking into consideration the comments of the Examiner. The Applicants contend that as presently amended, claims 1-18 avoid the Examiner's concerns.

The Examiner objected to the use of the expression "similar", in claims 1, 5 and 9, as being a relative term. The Examiner further objected to the claims to the extent that they are premised upon a limitation based upon a future event. The Applicants have amended claims 1, 5 and 9, to avoid the use of the expression "similar", and language which might allude to future events. The use of the expression "similar" has been replaced by identifying the contact face plating material as including the same principal metal or metals being plated onto the microelectronic workpiece. Claims 4, 8, 12, 14 and 17 identify the contact face layer or surface of the electrode as being formed or preconditioned from the same material as the workpiece plating material.

Claim 5 has been further amended to avoid an antecedent problem in connection with the expression a contact face layer. With respect to claims 13 and 16, amendments have been provided, which more clearly provide proper antecedent basis and clarify the scope of the objected to terms.

Duplicate claims 15 and 18 have been canceled.

35 U.S.C. §103(a) objections

The Examiner has rejected claims 1-8, and 13-15, under 103(a) as being unpatentable over Yee et al., U.S. Patent No. 5,078,852, in view of the Lowenheim text *Electroplating*, and Roedel U.S. Patent No. 1,308,508. Applicants submit, however, that claims 1-8, and 13-15, as presently amended, are distinct and nonobvious in view of the cited references.

In order to support an obviousness rejection, §2142 of the MPEP requires that three basic criteria must be met:

First, that there must be some suggestion (i.e. teaching), either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine the teachings.

Second, there must be a reasonable expectation of success.

Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations.

The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. In re Vaack, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

There is no suggestion or teaching to combine the teachings of the references as suggested by the Examiner. Furthermore, even if the references were to be combined as suggested by the Examiner, the combination would not teach or suggest each and every claim limitation. Consequently, the present application is not made obvious by the cited references.

Yee et al., '852, provides for a plating rack for use in electroplating a substrate. The plating rack includes cam assemblies for holding a substrate in place and for making electrical contact between the metal ring and the substrate. With respect to the cam, Yee et al., '852, states as follows:

"The cam itself is a bistable, rotatable probe tip that can be easily removed and replaced. It is made from an inert material, such as titanium so that electroplated metals such as copper can be etched back without attack of the cam." (emphasis added) Yee et al., '852, col. 4, lines 18-20

Yee et al., '852, expressly teaches that the cam is made from an inert material such as titanium. Yee et al., '852, further teaches an inert material is important in order to avoid attack of the cam when an electroplated metal such as copper is etched back. Yee et al., '852, also identifies the cam as being "bistable", a condition which indicates that the cam electrode is electrochemically inert for both an electroplating and an electroetching process.

The teachings of Yee et al., '852, are expressly contrary to the claims of the present application, which provide for the contact face of the electrode to be plated with or formed from a material comprising the same principal metal or metals being plated onto the microelectronic workpiece. Yee et al., '852, teaches that the cam and corresponding probe tip are made from titanium. Titanium is different from the principal metal which is being plated onto the workpiece, where in the one noted example from the quotation above, the material being electroplated is copper. Consequently, Yee et al., '852, fails to teach that the surface of the electrical contact is formed from or plated with a contact face plating material which includes the same principal metal or metals being plated onto the microelectronic workpiece, as provided by claim 1 of the present application.

The Examiner asserts Lowenheim discloses plating a metal onto a workpiece to impart specific properties such as wear resistance and conductivity. More specifically, the Examiner notes Lowenheim refers to plating gold onto a workpiece surface. However Lowenheim makes no mention of contact electrodes, nor does Lowenheim recognize a problem or identify a solution in the context of contact electrodes. The Examiner alleges that it would be obvious to plate the identified metals to impart the specific properties of the plated metal to the contact surface of the electrode. However, the purported qualities which the usage of materials in Lowenheim are alleged to enhance, are not deficiencies which have been established or can be attributed to the material used in Yee et al., '852, the principal reference. The material used in Yee et al., '852, for forming the cam electrode, namely titanium, already exhibits good wear resistance and good conductivity. Consequently, the teaching or suggestion asserted by the Examiner for combining Lowenheim with Yee et al., '852, so as to alter the surface characteristics of the electrode does not exist.

In any event, even if one were to attempt to combine the references as suggested by the Examiner, the combination still would not make obvious the claims of the present application. As noted, Lowenheim does not speak to the construction of electrodes for use in supplying an electrical connection with a workpiece surface. Similarly, Lowenheim does not address the construction of an electrode, in which the construction of the electrode is related to the type of material being plated. For example, Lowenheim does not address gold being plated onto a contact surface of an electrode for the purpose of plating gold or plating a material comprising gold onto the surface of the workpiece. Consequently, Lowenheim fails to suggest or teach that the surface of the electrical contact is formed from or plated with a contact face plating material which includes the same principal metal or metals, which are being plated onto the microelectronic workpiece, as provided for by the claims of the present application.

Similarly with respect to Roedel, '508, it would not be obvious to plate an electrode with a material, like lead. In Roedel, '508, a hook proper 9 is provided, which has one of its ends covered with a non-corrosive lead covering 10. The Applicants note, the lead covered hook in Roedel, '508, is not the element which operates as an electrode for providing an electrical connection with a workpiece. The electrical connection is provided by contact blocks 5 at the end of the legs 4 of the shank. An anode or cathode is hung from the hook proper 9. Together both the hook proper 9 and the anode or cathode swing to a position where the anode or cathode can contact the pair of blocks 5. It is through the blocks 5, via the shank 1 and lip 3, that the anode or cathode make electrical contact with the bus bar. In fact, the hook proper 9 is identified as being electrically insulated from the shank 1 (col. 1, lines 45-46), wherein the hook proper 9 can be insulated from the carrier by forming the bushing 7 from an insulating material (col. 1, line 55 to col. 2, line 2).

“the hook proper [9] being insulated from the shank [1] will not conduct current to the back of the form being plated.” Roedel, '508, col. 1, lines 45-46

Because the hook proper 9 is not used to provide an electrical contact with the anode or the cathode, the hook proper does not function as an electrode. Consequently, the fact that the hook proper 9 is covered by lead does not speak to the plating or preconditioning of the

contact surface of an electrode. Furthermore Rodel, '508, is silent with respect to the composition of the shank 1 or block 5, which are more closely analogous to performing the function of an electrode. Consequently, the teachings of Rodel, '508, are not applicable to the claims of the present application.

Still further the Applicants note that lead is a poor electrical conductor. Consequently, where one of the principal purposes of the claimed electrode of the present application is to provide an electrical connection with the workpiece, use of a poor electrical conductor for the contact surface in many instances would be less than desirable and therefore would not be obvious.

Where the Examiner alleges that it would be obvious to plate the electrode with lead to impart the non-corrosive properties to the contact surface of the electrode, the purported qualities, which the usage of lead are alleged to enhance, are not deficiencies which have been established or can be attributed to the material used in Yee et al., '852, the principal reference. The material used in Yee et al., '852, for forming the cam electrode, namely titanium, already is non-corrosive in nature. In fact the non-corrosive nature of titanium is about as good as it can get. Consequently, the teaching or suggestion asserted by the Examiner for combining the references so as to alter the surface characteristics of the electrode construction in Yee et al., '852, does not exist.

As a result, the only teaching or suggestion for making the claimed combination comes from the Applicants' own disclosure. In absence of a teaching or suggestion from the prior art, the corresponding asserted combination could only be the result of hindsight analysis -- inappropriate to support an obviousness type rejection.

Roedel, '508, similarly does not address the construction of an electrode, where the construction of the electrode is related to the type of material being plated. For example, lead is not being plated onto a contact surface of an electrode for the purpose of plating lead or a plating material comprising lead onto the surface of the workpiece. Consequently, Roedel, '508, fails to suggest or teach that the surface of the electrical contact is formed from or plated with a contact face plating material which includes the same principal metal or metals, which are being

plated onto the microelectronic workpiece, as provided for by the claims of the present application.

Neither Lowenheim, nor Roedel, '508, provide for pre-conditioning the contact surface of an electrode contact with a contact face plating material which includes the same principal metal or metals being plated onto the microelectronic workpiece. As a result, neither Yee et al., '852, Lowenheim, nor Roedel, '508, either alone or together teach or suggest all of the claim limitations.

The Examiner has rejected claims 9-12 and 16-18 of the present application, as being unpatentable over Yee et al., '852, in view of Lowenheim and Roedel, '508, as applied to claims 1-8 and 13-15, and in further view of Poris, U.S. Patent No. 5,723,028, and Mayer et al., U.S. Patent No. 4,118,301.

Poris, '028, has been cited only to the extent that it generally provides for electroplating copper onto a workpiece surface. Furthermore, it is noted, Poris, '028, is silent with respect to the construction of the electrode (i.e. cathode wires 4) used in supplying processing power to the workpiece during electrochemical processing.

Mayer et al., '301, generally provides for the use of a copper sleeve on a spring workpiece holder in the region where the holder contacts the workpiece for the purpose of electropolishing stainless steel items such as dinnerware. Specifically regarding FIG. 6 of Mayer et al., '301, and the related discussion in the specification, Mayer et al., '301, provides an electrode having a titanium body 78 covered with a soft copper sleeve 80. The purpose of this is to permit soft copper to be used, which is less vulnerable to etching than cold-worked copper, while still providing the desired "springy" characteristic of the titanium body 78. Mayer et al., '301, found that their attempt to provide a "springy" tempered (i.e cold worked) copper electrode turned out to be undesirable because the tempering increased the rate at which the electrode deteriorated due to etching (i.e. the electrode dissolved too fast).

Both Yee et al., '852, and Mayer et al., '301, acknowledge that copper is vulnerable to an etching process. Yee et al., '852, expressly identifies this as being undesirable. Consequently, Yee et al., '852, expressly teaches away from using a non-inert material in connection with the electrode. As a result, it would not be obvious nor would it be possible to

combine Yee et al., '852, and Mayer et al., '301, as suggested by the Examiner, without disregarding the express teaching of Yee et al., '852.

Furthermore, with respect to Mayer et al., '301, it is specifically noted that the use of the copper sleeve on the spring workpiece holder relates to a process for electropolishing stainless steel. Stainless steel is a material which is different than both copper or titanium, and therefore does not relate to the claims of the present application, which provide for a pre-conditioned contact surface formed from a contact face plating material, wherein the contact face plating material includes the same principal metal or metals being plated onto the microelectronic workpiece.

The claims of the present application have been amended to make this distinction even more clear. As noted in the specification of the present application, one of the reasons for using the same principal metal or metals, as the metal or metals being plated onto the microelectronic workpiece, is to prevent galvanic or other types of chemical reactions from developing at the contact surface of the electrode due to dissimilarities of the metals involved (pg. 77, lines 22-24). The use of stainless steel in combination with copper, being dissimilar metals, would not avoid the galvanic reactions the present claimed invention seeks to avoid.

Consequently, it would not be obvious to combine the references as suggested by the Examiner and even if one were to attempt to combine the references as suggested by the Examiner the combination would not make known or obvious the claims of the present application.

The Examiner's attempt to combine the teachings of the cited references is based on hind-sight reasoning. Likewise, the Examiner has used hind-sight reasoning in attempting to substitute elements from one reference into another where no basis is present in the prior art to suggest the substitution. As stated by the Court in C.R. Bard Inc. v. M3 Systems Inc., 48 USPQ2d 1225, 1232 (Fed. Cir. 1998), "it is insufficient that prior art shows similar components, unless it also contains some teaching, suggestion, or incentive for arriving at the claimed structure." As stated further by the Court in In re Sernaker, 217 USPQ 1, 6 (1983) in discussing an earlier case, "The lesson of this case appears to be that prior art references in combination do not make an invention obvious unless something in the prior art references would suggest the

advantage to be derived from combining their teachings.” Applicants submit that, as in the C.R. Bard Inc. v. M3 Systems Inc. case and in the Sernaker case, the claimed invention in the present case is nonobvious over the references because there is nothing in the prior art that would teach or suggest the claimed structure, where an improvement in

a workpiece holder including an electrode finger which is electrically capable of receiving and conducting electrical current supplied thereto to the workpiece

might be achieved by combining their teachings; nor is there anything in the references that would suggest that this improvement,

of providing an electrode finger contact face adapted to engage a surface of the workpiece where the contact face is preconditioned by plating onto the contact face a contact face plating layer made from a metal-containing contact face plating material which includes the same principal metal or metals being plated onto the workpiece

might be achieved by combining their teachings. The problems addressed by each of the references are different from the problems addressed by the other reference and also different from the problems addressed by the present invention. None of the references are concerned with providing

a preconditioned electrode finger contact face plating layer designed to contact the workpiece during an electroplating operation to avoid galvanic or other types of chemical reactions from developing due to dissimilarities of the metals involved.

The Examiner's incorrect conclusion of obviousness appears to be the result of his failure to view the invention as a whole and each of the references as a whole. There are many cases which state the requirement that the invention must be viewed as a whole and that each of the references must also be viewed as a whole when the issue of nonobviousness is confronted. In particular, the Examiner is not permitted to disregard disclosures in the references that diverge from and teach away from the invention at hand, W.L. Gore & Associates, Inc. v. Garlock, Inc., 220 USPQ 303, 311 (Fed. Cir. 1983).

In view of the foregoing, the Applicants submit that the claimed microelectronic workpiece holder and method for plating metals are distinct and nonobvious in view of the cited references. The present amendment does not add any new matter to the application, and the Applicants submit that the claims as presently amended are in condition for allowance. Accordingly, entry of the present amendment and allowance of the claims are earnestly requested.

Respectfully submitted,

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